



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Re Patent of: Qing Chen et al.  
Application No.: 10/091,788  
Filing Date: March 6, 2002  
Title: An Average Current Estimation Scheme  
for Switching Mode Power Supplies

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Commissioner for Patents  
PO Box 1450  
Alexandria, VA 22313-1450

**AFFIDAVIT OF JIN HE**

Dear Sir:

I, Jin He, declare as follows:

1. I am an engineer for TDK Innoveta, Inc. who is familiar with the technical details of the above-referenced invention.
2. The circuit taught in the Hirst patent (U.S. 5,789,723) is clearly distinguishable from the average current estimation circuit claimed in the present application. Specifically, the Hirst circuit is a power processing circuit, while the claimed current estimation circuit is a signal conditioning circuit. Key features of each respective circuit make them unsuitable for performing each other's respective tasks.
3. Because of its function, the power processing circuit in Hirst requires significantly greater power levels than the current estimation circuit of the present invention. This difference is inherent to the circuits' respective designs and functions.
4. The Hirst circuit has an inductor ( $L_1$ ) that is part of a boost converter and delivers stored energy when the switch is off. Such a boost converter has no place or function in a current estimation circuit.
5. A power processing circuit such as taught in Hirst is fed by a current source signal.

6. A signal conditioning circuit such as the one claimed in the present application is fed by a voltage signal that represents a current source. A power processing circuit similar to Hirst's would be used to provide such a voltage signal to the signal conditioning circuit. This point might help clarify the functional relationship between the two types of circuits in question.

7. The resistor (R11) in the claimed circuit does not exist in the Hirst circuit and would be prohibitive in a power processing circuit. This resistor is useful for signal processing by the current estimation circuit but is too lossy for power processing, which would reduce signal output, thus defeating the purpose of the inductor ( $L_1$ ) in the Hirst circuit.

8. The Hirst circuit has a diode (boost diode) that prevents the energy stored in the output capacitor discharge when the boost switch M2 turns on. Such a boost diode has no place or function in a current estimation circuit. In the claimed invention, the average current signal, represented by the voltage across C10, discharges when Q10 in the current estimation circuit turns on. It is this discharging time period that assures the averaging of the signal.

9. The Hirst circuit shown in Figure 12 is a boost converter where the output voltage (across the output capacitor) must be higher than the input voltage (across C2). Otherwise, the circuit will not work. In the current estimation circuit of the present invention, there is no such requirement. The purpose of this circuit is to capture a mid-point of the input signal across R10, which is the average value of the current signal.

10. The PWM control scheme used to control the switch (M2) in the Hirst circuit has to follow certain rules depending on the output capacitance, inductance ( $L_1$ ), load current, and the switching frequency. Otherwise, the Boost converter may not be stable. The claimed current estimation circuit in the present invention does not have this stability issue.

11. It is obvious to anyone of ordinary skill in the art who is familiar with power electronics and micro-electronics that the circuit topology, operating principle, and applications of the Hirst Boost converter are totally different from the claimed current estimation circuit.

12. I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 101 Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the patent.

Date: July 29, 2006

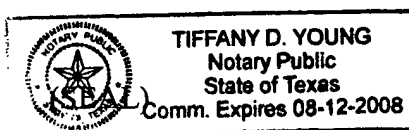
Respectfully submitted,

Jin He

THE STATE OF TEXAS   §  
                                     §  
COUNTY OF DALLAS   §

BEFORE ME, the undersigned authority, on the day personally appeared JIN HE known to me to be the person whose name is subscribed to the foregoing instrument and, being by me first duly sworn, upon oath declared that the statements and capacity acted in are true and correct.

Subscribed and sworn to before me, this 29th day of March, 2006, A.D., to certify which witness my Hand and seal of office:



Tiffany Young  
Notary